

## Stat 145 Homework Solutions: Chapter 16

### Problem 16.1

The standard error is:

$$\begin{aligned}\frac{s}{\sqrt{n}} &= \frac{9.3}{\sqrt{27}} \\ &\doteq 1.7898\end{aligned}$$

### Problem 16.2

The standard error was 0.01, so the standard deviation was:

$$\begin{aligned}\frac{s}{\sqrt{3}} &= 0.01 \\ s &= (0.01)(\sqrt{3}) \\ s &\doteq 0.0173\end{aligned}$$

### Problem 16.3

- (a) 2.015
- (b) 2.518

### Problem 16.5

- (a)  $df = 9, t^* = 2.262$
- (b)  $df = 19, t^* = 2.861$
- (c)  $df = 6, t^* = 1.440$

Problem 16.7

(a) To create a stemplot, round the data to the nearest 1 and arrange in ascending order:

49, 51, 55, 61, 63, 63, 64, 65, 65

The stemplot for this data appears below.

4	9
5	1
5	5
6	1334
6	55

The distribution is slightly skewed to the left, but the amount of skewness is not unreasonable given the small data set. There are no outliers.

(b) First, calculate  $\bar{x}$  and  $s$ . The mean is:

$$\bar{x} = \frac{63.4 + 65.0 + \dots + 51.0}{9} = 59.59$$

and the standard deviation is:

$$s = \sqrt{\frac{(63.4 - 59.59)^2 + \dots + (51.0 - 59.59)^2}{9 - 1}} \doteq 6.26$$

Second, use Table C to find the value of  $t^*$ :

$$\text{df} = 8, t^* = 2.306$$

A 95% confidence interval for  $\mu$  is:

$$\begin{aligned} 59.59 \pm 2.306 \left( \frac{6.26}{\sqrt{9}} \right) &\doteq 59.59 \pm 4.81 \\ &= (54.78, 64.40) \end{aligned}$$

Problem 16.10

The hypotheses are:

$$H_0 : \mu = 78.1$$

$$H_A : \mu \neq 78.1$$

The value of the test statistic is:

$$\begin{aligned} t &= \frac{59.59 - 78.1}{6.26/\sqrt{9}} \\ &\doteq -8.87 \end{aligned}$$

The  $P$ -value is:

$$\begin{aligned} P &= P(T \leq -8.87 \text{ or } T \geq 8.87) \\ &= 2P(T \geq 8.87) \end{aligned}$$

The  $P$ -value is less than  $2(.0005)$ , or  $.001$ . This is very strong evidence that the percent of nitrogen in the air during the Cretaceous era was different from 78.1.

Problem 16.12

- (a) The mean difference between the Vanguard index fund and the actively managed fund.  
(b) The hypotheses are:

$$\begin{aligned}H_0 : \mu &= 0 \\H_A : \mu &> 0\end{aligned}$$

- (c) The value of the test statistic is:

$$\begin{aligned}t &= \frac{2.83 - 0}{11.65/\sqrt{24}} \\&\doteq 1.19\end{aligned}$$

The  $P$ -value is:

$$P = P(T \geq 1.19)$$

The  $P$ -value is between .10 and .15. This is not convincing evidence that index funds outperform actively managed funds.

Problem 16.17

- (a) The degrees of freedom are equal to  $10 - 1 = 9$ .  
(b) The  $P$ -value is between .025 and .05.

Problem 16.20

(a) The degrees of freedom are equal to  $75 - 1 = 74$ . This value is not on the table, so be conservative and use degrees of freedom equal to 60. A 95% confidence interval for  $\mu$  is:

$$\begin{aligned} 24 \pm 2.000 \left( \frac{11}{\sqrt{75}} \right) &\doteq 24 \pm 2.54 \\ &= (21.46, 26.54) \end{aligned}$$

(b) The sample size is large.

Problem 16.33

(a) Each subject received both treatments.

(b) The hypotheses are:

$$\begin{aligned} H_0 : \mu &= 0 \\ H_A : \mu &\neq 0 \end{aligned}$$

The value of the test statistic is:

$$\begin{aligned} t &= \frac{-0.326 - 0}{0.181/\sqrt{6}} \\ &\doteq -4.41 \end{aligned}$$

The  $P$ -value is:

$$\begin{aligned} P &= P(T \leq -4.41 \text{ or } T \geq 4.41) \\ &= 2P(T \geq 4.41) \end{aligned}$$

The  $P$ -value is between  $2(.0025)$  and  $2(.005)$ , or  $.005$  and  $.01$ . This is very strong evidence that the treatment and control differ.